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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/HU84/00031</p> <p>(22) International Filing Date: 10 May 1984 (10.05.84)</p> <p>(31) Priority Application Number: 1620/83</p> <p>(32) Priority Date: 11 May 1983 (11.05.83)</p> <p>(33) Priority Country: HU</p> <p>(71) Applicant (for all designated States except US): MTA KÖZPONTI FIZIKAI KUTATÓ INTÉZETE [HU/HU]; Konkoly Thege ut 29-33., H-1525 Budapest XII. (HU).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only) : APAI, Pál [HU/HU]; Leányka u. 22., H-1221 Budapest XXII. (HU). KISS, Árpád [HU/HU]; Kruspér u. 6-8., H-1111 Budapest XI. (HU). KROÓ, Norbert [HU/HU]; Apáczai Csere J. u. 17., H-1052 Budapest V. (HU). RÓZSA, Károly [HU/HU]; Szakasits Á. ut 44/b., H-1115 Budapest XI. (HU). RUBIN, György [HU/HU]; Füle-mile ut 12-18., H-1121 Budapest XII. (HU).</p>	<p>(74) Agent: PATENTBUREAU DANUBIA; P.O. Box 198., H-1368 Budapest (HU).</p> <p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.</p> <p>Published With international search report.</p>	
<p>(54) Title: METHOD AND DEVICE FOR STIMULATING BIOLOGICAL PROCESSES</p> <p>(57) Abstract</p> <p>The method and device is designed for biostimulation (for example wound-healing, acupuncture, rheumatologic and cosmetic purposes). The device includes a light source connected to a power supply, the light source consists of one or more light emitting diodes. The said light emitting diodes which have advantageously polarized light or are equipped with a polarizer are connected to a power supply which includes a modulator.</p>		

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METHOD AND DEVICE FOR STIMULATING BIOLOGICAL  
PROCESSES

5       The subject matter of the invention is  
a method and device for stimulating biological  
processes, for example for wound-healing, acu-  
puncture, rheumatology and cosmetic purposes.

10       It is known that for treating wounds slow  
in healing lasers may be used in clinical practice.  
Such lasers are generally He-Ne or Ar-ion lasers.  
During treatment the laser light beam is directed  
to the wound by means of appropriate optical de-  
vices, and by moving the beam, the whole surface of  
the wound is swept. Several contradictory theories  
15 have been put forward to explain the biologically  
stimulating effect of the laser light but at present  
no generally accepted scientific interpretation is  
available. The publications mostly provide only the  
results of the treatments and only a few attempts  
20 were made to decide to which specific feature of the  
laser is the biostimulative effect due. On the basis  
of the results published, a general work is for  
example, "Der Laser" by Endre MESTER (Springer Verlag,  
1981), laser beam treatment has greater potential  
25 applications in clinical practice than have so far  
been taken advantage of.

It should however be said that certain  
factors obstruct the general employment of laser  
treatment in clinical practice. One of these fac-  
30 tors is that continuously working lasers having  
appropriate beam diameter and efficiency are expen-  
sive, the other factor is that, these lasers have  
intricate structural set up and their operating vol-  
tage is high therefore their handling requires spe-



- 2 -

cific knowledge. Another drawback is that as there are technical limits of increase the beam diameter in cases if you wish to ensure the generally used power density of  $2-10 \text{ mW/cm}^2$  for any single treatment so the sweeping of wounds of bigger surface requires due foresight.

When treating wounds slow in healing successful experiments were performed by means of projection machines equipped with a polarizer and an infra-red cutting filter in addition to the usual optical system (Bazsó, Varju, Szegő, Rózsa, Apai: "Employment of incoherent polarized wide-band light beam for facilitating wound healing" KFKI 1981-73., Budapest). Although such projection machines are not as expensive as lasers, they are large, they generally require cooling, and they work with low efficiency.

The aim of this invention was to produce a device which stimulated biological processes at least to the same extent as the devices known so far but which is simple in structure, is inexpensive, small-sized, reliable, has a long life as well as being efficient and thus can widely be used in addition to medical applications for cosmetic purposes and for treatment at home.

The invention overcome the drawbacks of currently available devices by utilizing one or more light emitting diodes (LEDs) as light source. LEDs give advantageously polarized light or may be equipped with a polarizer. These LEDs are equipped with a power supply including a modulator.

Larger surfaces can advantageously be irradiated by utilizing additional LEDs, for example by arranging them in matrix which enable uniform and



- 3 -

rapid treatment of the whole surface without sweeping. In contrast to the practice until now that filtered the infra-red rays, LEDs working in the infra-red range can advantageously be applied as well, especially for the treatment of the tissues which are deep below the skin - as a result of the increased penetration depth. The equipment embodies a power supply with a modulator by means of which the LEDs can emit light pulse series enabling high peak power of the pulses at low average power. In the case of lasers used for similar purposes such modulation can be realized only in a narrower power range and with complicated and expensive equipment.

It may be advantageous to use LEDs with polarized light or to use a polarizer in front of the non-polarized LEDs. For the latter case a polarizer prism, polarizer plate or a glass plate placed at appropriate angles (Brewster angle) can be used as the polarizer.

The said invention is thus simple and safe, low in price, has great reliability and long life thereby enabling the general use of the equipment and its employment for treatment at home or for cosmetic purposes.



- 4 -

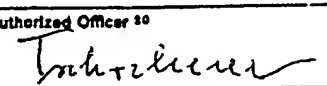
## C L A I M S

1. Method for stimulating biological processes mainly for wound-healing, acupuncture,  
5 rheumatologic and cosmetic purposes c h a -  
r a c t e r i z e d i n that the light of  
light emitting diodes is used for radiation  
treatments.
2. Device for stimulating biological  
10 processes mainly for wound-healing, acupuncture,  
rheumatologic and cosmetic purposes, containing  
a light source connected to a power supply c h a -  
r a c t e r i z e d b y the light source  
consisting of one or more light emitting diodes.
- 15 3. The device described in claim 1,  
c h a r a c t e r i z e d b y the embodi-  
ment of LED (LEDs) with polarized light or by it  
(them) being equipped with a polarizer.
4. The device described in claims 1 and  
20 2, c h a r a c t e r i z e d b y the LED  
(LEDs) being connected to a power supply.
5. The device described in claims 2-4,  
c h a r a c t e r i z e d i n that the LEDs  
are arranged in form of matrix.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/HU 84/00031

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>3</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. <sup>3</sup> : A 61 N 5/06, A 61 H 39/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
IPC <sup>3</sup>	A 61 N 5/00, A 61 H 39/00, G 09 F 9/00	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>6</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	US, A, 4 112 923 (TOMECEK) 12 September 1978 (12.09.78),	(1,2,4)
Y	see abstract, column 5, lines 14-16, fig.7.	(5)
Y	US, A, 4 241 277 (HINTZE) 23 Dezember 1980 (23.12.80), see abstract, fig. 1.	(5)
X	FR, A1, 2 371 935 (NOGIER) 23 June 1978 (23.06.78),	(1,2,4)
Y	see page 2, lines 22-25, page 3, line 40 - page 4, line 3, fig. 3.	(3)
Y	DE, A1, 3 220 218 (FENYÖ) 17 March 1983 (17.03.83), see abstract, claim 1, page 7, line 30 - page 8, line 17.	(3)
X	FR, A2, 2 399 256 (SKOVAJSA) 2 March 1979 (02.03.79), see page 1, lines 1-3, page 2, line 30 - page 3, line 6, fig. 2,3.	(1,2,4,5)
<p><sup>6</sup> Special categories of cited documents: <sup>19</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>8</sup>	Date of Mailing of this International Search Report <sup>9</sup>	
13 June 1984 (13.06.84)	20 June 1984 (20.06.84)	
International Searching Authority <sup>1</sup>	Signature of Authorized Officer <sup>10</sup>	
AUSTRIAN PATENT OFFICE		

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No <sup>18</sup>
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X	EP, A2, 0 058 105 (JAVELLE) 18 August 1982 (18.08.82), see page 6, line 36 - page 7, line 25.	(1,2,4)
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X	DE, A1, 3 237 398 (CESKOSLOVENSKE AKADEMIE) 28 April 1983 (28.04.83), see abstract, claim 1, page 6, line 23 - page 7, line 10, fig. 2,3.	(1,2,4)
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Anhang zum internationalen Recherchenbericht  
Über die internationale Patentanmeldung  
Nr.

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentedokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

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US-A -4 112 923	12/09/1978	None	
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		GB-A1-1 600 217	14/10/1981
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		HU-B - 180 083	28/01/1983
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		BE-A1- 891 860	17/05/1982
		FR-A1-2 498 927	06/03/1982
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		JP-A2-58-130 042	03/08/1983